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I. *T A B L E S of the Barometrical Altitudes at Zurich in Switzerland in the Year 1708. observed by Dr. Joh. Ja. Scheuchzer, F. R. S. and at Upminster in England, observed at the same time by Mr. W. Derham, F. R. S. as also the Rain at Pisa in Italy in 1707. and 1708. observed there by Dr. Michael Angelo Tilli, F. R. S. and at Zurich in 1708. and at Upminster in all that time: With Remarks on the same Tables, as also on the Winds, Heat and Cold, and divers other Matters occurring in those three different Parts of Europe. By Mr. W. Derham, Rector of Upminster.*

**I**T being the Pleasure of our most illustrious Society, to put into my hands (according to Dr. *Scheuchzer's* desire) his Observations of the Weather, &c. made at *Zurich* in the Year 1708. and having also my self received from Dr. *Mich. Angelo Tilli* the quantity of Rain which he observed to fall at *Pisa*; I have accordingly compar'd these Observations with mine made at the same time at *Upminster*. And to represent them the better at an easy view, I have put what I could of them into the annexed Tables. In the former of which, I have represented Dr. *Scheuchzer's* and my Barometrical Observations: In the later, his Rain Observations, those of Dr. *M. A. Tilly*, and mine own; all reduced to the same, that is, our English measure, that they may the more easily be seen and compar'd together. But because I am not as yet

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certain of the true Proportion between the *Tuscan* and *English* weight, I have therefore given Dr. M. A. Tilli's Rain, both in the *Tuscan* Pounds and Ounces as he sent it me; as also reduced to our *English* Troy-pound and Centesimals of that Pound, according to Mr. Greaves's proportion, which is different from that assigned by Sir *Jonas Moor*.

As to Dr. *Scheuchzer's* other Observations of the Winds, the Weather, the Thermometer, and divers other very curious and remarkable Matters, I have not inserted them into particular Tables, because these following general Remarks may in some measure supply that defect.

I. For the *Thermometer*. It would have been in vain to have compared his Observations with mine, by reason we have not yet a Standard for Thermometers, as we have for the Barometers; they being every where in all, or most respects different; some with large, some with small Bottles of Spirits; some accordingly with longer, some with shorter; some with wider, some with narrower Canes, or Shanks; some filled with more highly rectify'd, and consequently more expansive Spirits, some with more phlegmatick and duller Spirits.

The difference particularly between Dr. *Scheuchzer's* and my Thermometer is, his is about one Foot long; that I observed with all along (till it was broken this Year) about two Feet and a half; and that I now observe with, three Feet and a quarter; the bore of the Stalk is small, and the Ball is large, and consequently the Rang great, answering every the least alteration of Heat and Cold.

But yet thus much I have been able to observe by comparing Dr. *Scheuchzer's* and my Thermometrical Observations, viz. That notwithstanding the *Alpine* Snows have mighty Effects on the Weather in *Switzerland*, and other conterminous Places, yet there is much more agreement between the Heats and Cold at *Zurich* and *Upminster*,  
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than before comparing them, I imagined. (I speak with relation to last Year only, having no other Observations.) For in Winter, although I imagine we have more warm days than they ; and in Summer, that they have greater Heats than we ; yet I observe that the Colds and Heats in both Places, begin and end nearly about the same time : Yea, that oftentimes any remarkable Weather (especially if of somewhat long continuance) affecteth one as well as the other place. Thus for instance, *June*, which was (some part of it at least, particularly the very day after the Solstitial-day, *June 12.*) remarkably Cold in *England*, seems to have been not very different at *Zurich* ; Dr. *Schenckzer's* Thermometer divers times that Month (though not on the very same days perhaps) descending as low, or rather lower than in the Month before, yea as low as many days in the Winter Months. But one thing I farther observed was, that all this Month their cold Weather constantly preceded ours here about five or more Days. An Indication that (as shall be farther observed hereafter) the Weather in both Places was influenced by the same Causes, whether the Alpine Hills and Cold, or the Influx of the Moon and other heavenly Bodies, or any other Cause, I shall not enquire.

And as in *June* there was a great agreement in the unusual Cold, so in *August* there was not much less agreement in Heat ; the Heats in both places being great, and beginning to abate about the same time, only a little sooner here than there.

In Winter also, although, as I said, I imagine we have a greater number of warmer Days than they, yet I find that a warm Winter Month there is so here ; and a cold one there is a cold one here likewise. Thus in *February* and *March*, *October* and *November*, a great agreement seems to have been between the Heats and Colds of both Places, some Days excepted. But *January* was at the beginning not so constantly Cold, for the Season, at *Uyminster*, as  
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it seems to have been at *Zurich*. And *December* last, which from the 8th Day to *Christmas*-day, was here moderate and open Weather, and after that more intensely Cold than even in the *Long-Frost Anno* 1683. by the fewer Thermometrical Observations which Dr. *Scheuchzer* made then, than in other Months, the greatest part, I say, of that Month seems to have been intensely cold at *Zurich*, as the later part thereof was with us remarkably in *England*.

Thus much for the *Thermometrical Observations*. The

II. Remark I shall make, shall be of the *Winds*: Which also I did not enter into Tables, because it may be sufficient to observe in general, That although many Days they agree in both places, yet there are many more in which they differ. When they do agree, I find it is chiefly when the Winds are strong, and of long continuance; And more I think when Northerly and Easterly, than in the other Points. Also I have observed, That a strong Wind in one place hath been a weak one in the other.

III. As to the *Barometrical Observations*, I have thought it worth while to specify them. Mine own Observations I selected which were made at Noon; and Dr. *Scheuchzer's* as near Noon as might be. For which reason I commonly took his Morning Observations, because made for the most part about 10 or 11 of Clock. Also I took those made with his Bent-Barometer; because they seemed to me (especially at the beginning of the Year) to be the most accurate.

The Altitudes of his Mercury he measureth by the *Paris* foot, which I have reduced to our *English* measure, that they may be at an easy view compared with mine:

For which reason I have also all along noted their Differences.

It is manifest from the Tables, That throughout the whole Year, the Mercury was lower at *Zurich* than at *Upminster*, by sometimes one, sometimes above two Inches *English*. The most remarkable difference was at the latter end of *September* and beginning of *October*, when the difference was for a good while above two Inches *English*. The reason of which, I guess, was because at *Zurich* I imagine the Air was more enclined to wet, at that time, than at *Upminster*; as also because the Winds then were Northerly and Easterly with us; which, 'tis well known, do make our Barometers rise, even in wet Weather. But the mean difference between Dr. *Schenkelzer's* and my Barometers, I take to be about half an Inch *English*. From whence I conclude, That the Situation of *Zurich* is near a Quarter of an *English* Mile higher than that of *Upminster* above the surface of the Sea; or else that that part of the Terraqueous Globe, lying nearer the Line, is (according to the received Opinion) higher, or farther distant from the Center, than ours is, lying nearer the Pole.

Farther. It may be observed from the annexed Barometrical Tables, That (as near the Equinoctial the Barometer is observed to stand nearly at a stay, but the more Northerly the Latitude, the greater the range of the Mercury, so) at *Zurich* the difference (last Year) was not so great between the highest and lowest stations of the  $\gamma$ , as it was either at *Paris* or *Upminster*. For at *Zurich* the difference was only one Inch *Paris*-measure; at *Paris* Dr. *Schenkelzer* saith it was one Inch two Lines and an half; but at *Upminster* it was 1,8 Inch, (and some Years 'tis more) which is greater than either of them.

The last thing which I shall take notice of relating to our Barometrical Observations is, That I observe although there

there be some, and that a pretty deal of agreement between the rising and falling of our Barometers, one being very often high or low, when the other is so; and one oftentimes rising or falling when the other doth so; and one rising much or little, or falling much or little when the other doth: I say although the matter is often thus, yet it is not so certainly so, as it is nearer home. In our *Philos. Transf.* N. 286. I have given a Table of some Heights of the Mercury observed at *Upminster*, and at 200 Miles distance in *Lancashire* at the same time. And in the *Hist. de l'Acad. Roy. des Scien. Anno 1699.* Monsieur *Meraldi*, by comparing his Observations at the *Paris Observatory* with mine at *Upminster*, takes notice, "That there is a great agreement between the variation of the Heights of the Barometers in both Places; that he finds almost always that when one riseth or falleth, the other doth so too, although not always alike: That the Days in each Month whereon the Mercury hath been highest or lowest, it hath been the same at *Paris* as at *Upminster*, but ordinarily somewhat more than 3 or 4 Lines lower at *Paris* than *Upminster*." But the Agreement between the Variations of Dr. *Scheuchzer's* Barometers and mine, although I say often great, yet is not so constantly, nor so certainly great as nearer home, viz. at *London*, *Lancashire*, *Paris*, and other places, with which I have made the comparison.

IV. The next Remark I shall make, shall be on the *Tables of Rain*, observed at *Pisa* in *Italy*, by Dr. *Mich. Angelo Tilli*, Botannick Professor there; and at *Zurich* in *Switzerland*, by Dr. *J. F. Scheuchzer*; both very ingenious, curious, and diligent Members of this learned and honourable Society; and lastly, by my self at *Upminster* in *Essex*. The *Italian* Observations were procured

for me by the Society, as well as my illustrious Friend, Dr. *Newton*, Her Majesties very ingenious and learned *Envoy* at *Florence*, and a very useful Member of this Society.

1. The first thing that in these Rain-Tables represents it self to our view, is, That the Rains for the most part are more frequent at *Upminster* than either at *Zurich* or *Pisa*; I mean We have more Rainy Days than They. But yet

2. The Rains in both these Places are much greater in Quantity, in the whole Year, and in some Months, especially the Autumnal and Winter Months, than our Rains are at *Upminster*. *May*, *June*, and *July*, and a great part of *August* in 1707. seem to have been very dry, and I suppose searching Months at *Pisa*, as in some measure some of them were here: And in that time less Rain fell there than here. But the following Autumnal Months made, at *Pisa*, sufficient amends, either by the great quantity that fell at a time, I suppose in Thunder, and such like hasty large Showers; or else by the Quantity and Frequency both. What a prodigious Quantity was that, for instance, of above 32 pounds on *August* 19? (if it all fell on that, and not some on the preceding days.) But we find very large Quantities at a time to have fallen on divers Days, where it is manifest the Rain was weighed every Day, *viz.* 10 Pound, 9 Pound, and other large Quantities for several Days together, in the cooler autumnal Months. But as the Weather groweth warmer, I imagine their Rains at *Pisa* are fewer; and what falleth, falleth in large quantities. For which reason the quantity of Rain in the Spring-months of *March*, *April*, and *May* 1708. (oftentimes dripping Months in *England*) is nearly the same both at *Pisa* and *Upminster*.



As to the Rain at *Zurich*, I observe, That although their Rains are less frequent than ours in *Essex*, yet they seem to be more frequent than theirs at *Pisa*: but the quantity at *Zurich* is greater than at *Upminster*, and less than at *Pisa*.

'Tis Dr. *Scheuchzer's* Opinion, "That more Rain falleth in *Switzerland* than in *France*, at *Zurich* than at *Paris*. To confirm which he giveth us this Table of eight Years Rain at *Paris*, to which I shall add mine for *Upminster*.

The Rain at Paris in 8 Years.				At Upm.	
The Year.	Depth in Lines of Paris measure.	Depth in Inches of Paris measure.	Depth in English Inches & Centes.	Depth in English Inches and Centesimal.	
1699	224	$\frac{1}{4}$ 18 8	$\frac{1}{4}$ 19 93	15	11
1700	240	$\frac{1}{2}$ 20	$\frac{1}{2}$ 21 37	19	03
1701	256	$\frac{1}{4}$ 21 4	$\frac{1}{4}$ 22 77	18	69
1702	196	$\frac{1}{4}$ 16 4	$\frac{1}{4}$ 17 45	20	38
1703	208	$\frac{1}{4}$ 17 4	$\frac{1}{4}$ 18 51	23	99
1704	238	$\frac{1}{2}$ 19 10	$\frac{1}{2}$ 21 20	15	80
1705	166	$\frac{1}{4}$ 13 10	$\frac{3}{4}$ 14 82	16	93
1706	183	$\frac{1}{2}$ 15 3	$\frac{1}{2}$ 16 31	24	29
Total Depth		$\frac{1}{4}$ 142 10	$\frac{1}{4}$ 152 36	154	22

It is manifest from this Table, That the *Zurich* Rain last Year (although it amounted not to the Quantity which fell at *Pisa* in a whole Year, yet) exceeded both the *Paris* and *Upminster* annual Rains of 8 Years before. But whether it constantly doth so or not, if God spare them Life, the future Observations which Dr. *Scheuchzer* and Dr. *Tilli* promise us will demonstrate.

But before I quit my Remarks on this last Table, 'tis necessary that I take notice, That there is a greater difference

rence between these last 8 Years Rain at *Paris* and *Upminster*, than I found in the 8 Years, in which I formerly compared the Rain of *Towneley*, *Paris*, *Lisle*, and *Upminster* together, in *Philos. Transf. N. 297*. For by that comparison it appeared, that less Rain fell at *Upminster*, than at either of the other three Places. But according to these later 8 Years in the Table, a small matter more fallerh at *Upminster* than at *Paris*. For the mean Proportion for *Paris* (which according to former Years was above 20 Inches *Paris* measure, or 22 Inches *English*) is according to these last 8 Years no more than 17 Inches, 9 Lines, *Paris*-measure, or 19 Inches *English*: And *Upminster*-Rain, which I formerly computed at, Year for Year, about 20 Inches and an half *English*, is for these 8 Years much the same, or a little more than that at *Paris*.

The Proportions therefore which I shall now lay down for the yearly Rain of all Places, whose Rain I have had information of, are these; for *Zurich* (till farther Observations are made)  $32 \frac{1}{2}$  Inches; for *Pisa* (till farther Observations also)  $43 \frac{1}{4}$  Inches; for *Paris*, 19 Inches; for *Lisle*, 4 Inches; for *Towneley* in *Lancashire*  $42 \frac{1}{2}$  Inches; for *Upminster*  $19 \frac{1}{4}$  Inches; all the same, that is *English*-measure.

3. The last Observation I shall make upon the Rain Tables is, The great use of Cold to the making of Rain. That Exhalations and Vapours are the matter of Rain, is not to be doubted. And how they are raised, whether according to the learned and ingenious *Dr. Woodward's*, or any other Hypothesis, I shall not enquire. It is sufficient for my present purpose to say, That when those Vapours are raised, they are constipated and condensed into Clouds and Rain, chiefly by the Cold of the Air to which they are elevated. And the greater the quantity of Vapours raised is, and withal the more intense the Cold of those airy Regions, the greater is the quantity of

of Rain. This although probably a matter well known and scarce doubted, yet may deserve special Consideration, because it will lead me to divers observables. Now this is manifest from the annexed Tables compared with Dr. *Scheuchzer's* and my Weather, &c. Observations. Thus for instance *January*, which Dr. *Scheuchzer* frequently observed was sometimes warm, sometimes cold, and appeareth farther to have been so by his Thermometrical Column, and which was the same with us in *South-Britain*, that Month, I say, had plenty of Rain at *Zurich*, *Upminster*, yea, and *Pisa* too. The same might be said of *February* for *Zurich*, and probably *Pisa* too. So also for *December* in 1707. at *Pisa* and *Upminster*; and *December* last at *Zurich* and *Upminster*. But with us *February* was for the most part a cold Month, and the Rain the less, by reason the Vapours either could not be raised in plenty enough, or not be carried high enough, or suspended long enough to be united, but soon were precipitated back again to the earth.

From these Causes assigned, the plenty of Exhalations and Cold of the airy Regions, I conceived it is, that at *Upminster*, about the Equinoxes, we have often more Rain than at other Seasons. But I cannot say this is certain and constant. Thus it was at the Autumnal Equinox in 1707, not only at *Upminster*, but at *Pisa* too: So at *Zurich*, *Pisa* and *Upminster* about the Vernal in 1708. and at *Zurich* and *Upminster* the last Autumnal Equinox. And this very 28th of *March* 1709. whilst I am writing this, I have a pregnant Proof of what I am saying. For not only the unusual Cold of the Winter hath been succeeded by as unusual quantities of Rain all this Month; but at this very time the Weather is open, but withal cool. Particularly *March* 26. many Vapours arose, so as to fill the Air with a warm stinking Fog. The Night following a smart shower of Hail fell, a manifest indication of the Cold of the middle, or top of the lower Region of  
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the Air. And the day after, *viz.* March 27. proved so wet a day, that almost 5 pound of Rain fell through my Tunnel, a large quantity for the compass of 12 Inches Diameter in 14 or 15 hours time. The Wind and Clouds were all the while calm and still, and frequently changing from Point to Point, near round the whole Compass; and the Rain that fell, fell thick, in small drops. Which makes me think, that the warm foggy Vapours, raised in great plenty the day or two before, as soon as they were mounted aloft, met with suddain extreme Cold of the middle Region, and were thereby hastily condensed, and the Air being at the same time very light (the Barometer being then very low) they speedily tumbled down in small and thick Drops of Rain.

And this I take to be the very case of the vernal and autumnal Rains already mentioned, *viz.* In Spring, when the Earth and Waters are loosed from the brumal Constipations, the Vapours arise in great plenty. So also in Autumn, when the Heats that dissipated them in Summer, and also warmed the superiour Regions, are abated, the Vapours raised then in great plenty are soon condensed by the Cold of the superiour Regions, and so are forced down in more plentiful Rains than at other Seasons, when either the Vapours are fewer, or Cold of the superiour Regions less.

For a farther proof, or at least illustration of what hath been said, let us again cast an Eye upon *June* last, a Month as unseasonably wet, as 'twas unusually Cold. The Cold thereof I have already taken notice of; and the wet Weather accompanying it was so unseasonable to us in *South-Britain*, that although we had great and welcome Crops of Hay after a great scarcity the preceding Year, yet we had scarcely any good Weather to make it in. So Dr. *Schenckzer* saith it was with them in *Switzerland*, in his Remarks on that Month: *Fuit hic mensis, ut ex pluvia mensuratum constat, præter modum humidus, & mag-*

*no quidem Vegetabilibus Hominibusque damno. Multum computruit Fœnum; Gramina, quæ nondum fuere resecta, ad nimum venire maturitatis gradum. Vites earumque Flosculi multa sustinuerunt damna a Pluvie continuo ferè lapsu; deciderunt tenella Petala, Foliis rubigo inducta est, ni macra admodum sit Autumni venturi spes, &c.*

Having thus considered the use of Cold to the production of Rain, I shall shut up these Remarks with one thing concerning the *Alps*; and that is, I cannot but think that those and all such like high Mountains, and the Snows they are covered with, are of great use to the neighbouring, yea more distant Countries, in generating their Rain, and performing other great Offices of Nature. From some Observations I have made in running over, and comparing Dr. *Schenckzer's* and my own larger Tables, I have so frequently observed the Risings and Fallings of the Barometer, some of the most considerable Variations of the Wind, the most remarkable Alterations of Heat and Cold, and of wet and dry; I have, I say, so often observed many of these to precede in one place what hath follow'd in another, that I am apt to think that even *England* may sometimes partake of the effects of the *Alpine Mountains* upon the Air and Vapours. It is certain that their very cold Weather in *December* last, and the Relaxation thereof preceded ours: Which makes me inclined to think it might probably be derived from them to us. All the former part of that Month, especially from about the 8th day till the 24th, was here mild and open. But on *Christmas-day* it began to be colder, and the following days to freeze harder and harder; insomuch that on *December 30.* my Thermometer was a great deal lower than ever I had seen it before. And two curious Persons in *London* told me, that the Spirits in their Thermometers fell several degrees lower this last Winter, than they had done in the self-same Thermometers during all the long and remarkable Frost in the Year 1683. Whether

ther at *Zurich* the Cold was more excessive, than it used to be in other Years, Dr. *Scheuchzer* doth not say; but he noteth the Air to have been excessively Cold, and his Thermometrical Observations shew it to have been so some time before, in, and after *Christmas*. And Dr. *Newton* in a Letter he honoured me with lately from *Florence*, saith, " The Cold was there so great, that for twenty Years past they had not been sensible of greater; it " wanting on *Twelfth-day* but half a Degree of the Extreme. " mity. Their *Twelfth-day* I reckon fell on *December 26*. O. S. and consequently their so eminently Freezing-day preceded ours about four Days.

And as their Cold, so by Dr. *Scheuchzer's* Observations, I find the Relaxation thereof preceded ours a short time. For about the later end of *December* the Weather appears to have been milder, at least less intensely Cold with them. And so was ours at the beginning of *January*, about as many days after theirs, as their Cold preceded ours.

Thus I have given one eminent Instance of what I found lesser Examples frequently, as I run over Dr. *Scheuchzer's* last Year's Observations. But whether there may be any farther Reasons for any such Conclusions about the Influences of the Alpine Eminences and Colds upon far distant places, future Observations will I hope determine. But as to their Influences nearer home, Dr. *Scheuchzer* saith, *Alpes fecunda mater sunt, ut Fluminum & Nubium, ita quoque Nivis & Pluviae. Credibile omnino est, loca Maris, Alpibusque viciniora, plus etiam experiri Pluviae prae remotioribus aliis.*

To these Remarks I might add Dr. *Scheuchzer's* Observations of the Occurrences in each Month of what was curious as to Meteors, the State of Health and Diseases, &c. also the increase and decrease of their *Zurich River*, the *Limat*, which (like other Rivers that have their Source in the *Alps*) he puts beyond all doubt (in my Opinion) to receive

receive greater Increments from the melting of the *Alpine* Snows, than from all the wet proceeding from their Rains. But as I have been long already, these things would add more to the length of what I have said; and therefore I shall rather chuse to refer to his Observations at large, than injure them by an Abridgment.

Here I was putting an end to my Remarks, but in the same moment I received Letters from the before-commended Dr. *Newton* from *Florence*, and Dr. *M. A. Tilli* from *Pisa*. In the later of which are some Observations that so directly relate to what I have before taken notice of, that I must beg Pardon for a small Addition to what I have said.

Dr. *Tilli's* half Year's Rain coming too late, I have put it alone in the additional Table. From which Table compared with the foregoing Tables it appears, that although, in the Year before, *June* and other Summer-Months were *dry*, yet last *June* was a *wet* Month at *Pisa*, as well as *Zurich* and *Upminster*, and so likewise was it about the Autumnal Equinox: and for the same Reasons, I imagine, which I have already mentioned.

As to the Excess of the *Pisa-Rain* above that of other Places (concerning which I wrote to Dr. *Tilli*) he attributeth it to the same cause (he saith) that I did that of *Lancashire*, namely, the Height of the Hills, and the Blowing of the Winds for a long time from some one Quarter. His Observation is this, *Libenter admitto Pluviam nostram semper, vel ut plurimum vestram superare, eâ sane ratione ut ——— animadvertisti; & præcipuè si aspera Corsica jurga, autumnî tempore, nive citò cooperiantur: Tunc Australes venti diu vigent & Imbres. Aquilonares verò frequentius circa Florentinos colles, quàm circa Pisanam urbem spirare planè constat. Est enim hæc civitas a Boreâ circumdata montibus, & pari intervallo circa milliaria quinque distat a mari.*

The same Account of the Situation of *Pisa*, and the great quantity of Rain falling there, I remember I had some  
time

time since from a very ingenious Member of this Society. Mr. *Aston*, who hath been there; who withal added (if I mistake not) that *Pisa* was for that reason called, or might be called, *The Piss-pot of Italy*.

Besides what is mentioned, there are in the Letters of those two curious Gentlemen divers other things, some of them relating particularly to this last Winter's remarkably severe Frost in *Italy*. But these with some other Accounts relating to the same subject, as they may be more seasonable, so I intend them for the Societies Diversion and Service (if God spare a little life and leisure) in a short time.

Just as I was putting a finishing Hand to this, I received from *Dublin*, Mr. *Molyneaux's* Observations there of the Weather, Winds, Rain, &c. during the last Year: Which I am sorry arrived no sooner, that they might have accompanied, and been seen together with the foregoing Observations. But it being now too late, I shall take some other, though less opportune time, to acquaint this most illustrious Society with them.



*A Table shewing at an easie View the Heights of the Mercury in the Barometer in English Inches and Centesimals of an Inch, both at Zurich in Switzerland, and at Upminster in South-Britain, together with the Differences of those Heights, throughout the Year 1708.*

January.				February.			
D. of Mo.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	
1	28	129	41	3	28	29	51
2					8	52	144
3	17	14	97	17	52	1	36
4	26	43	17	17	39	1	22
5	17	43	25	25	37		12
6		1	28	17	44	1	27
7	17	43	26	12	35	1	23
8	27	99	51	6	40	1	32
9	64	28	78	14	67	1	27
10	45	50	4	5	87	1	72
11	46	97	51	14	30	21	88
12	99	29	38	17	90	22	12
13	73	23	50	82	29	67	84
14	73	11	38	18	49		49
15	27	99	28	17	82	45	62
16				84	47	1	63
17	28	17	29	81	32	1	51
18	8	28	89	27	95	33	38
19	27	90	29	81	36	1	55
20	90	15	25	28	25	1	25
21	81	28	80	17	8		91
22	73	95	22	38	41	1	3
23	99	29	12	35	48	1	13
24	90	20	30	17	47	1	30
25							
26				20	25	1	5
27	81	57	66	15	22	1	7
28	81	95	214	27	95	28	95
29				85	94	1	9
30							
31	28	8	76				

March.				April.			
D. of M.	Zurich in Eng. inches	Up. in Engl. inches.	Dif. in Engl. inches.	Zurich in Engl. inches.	Up. in Engl. inches.	Dif. in Engl. inches.	
1	27 9	29 22	1 32	28	28 97	0 97	
2	28	23	1 23	27 95	94	0 99	
3	27 85	42	1 57	90	29 28	1 38	
4	85	64	1 83	81	53	1 72	
5	28	73	1 73	90	45	1 55	
6	1	44	1 32	85	65	1 86	
7	6	73	1 67	90	65	1 75	
8	27 81	30 12	2 31	28	50	1 50	
9	81	29 46	1 65	00	60	1 60	
10	85	18	1 33	27 62	62	1 98	
11	75	30	1 55	75	77	2 2	
12	81	50	1 69	72	62	1 90	
13	85	59	1 74	90	80	1 96	
14	85	45	1 60	28	91	1 91	
15	28 6	37	1 31	6	89	1 83	
16	13	47	1 34	8	88	1 80	
17	8	52	1 44	27 95	93	1 98	
18	27 90	33	1 43	95	85	1 90	
19	28 6	21	1 15	28	89	1 89	
20				6	88	1 82	
21	27 85	34	1 49	6			
22	72	8	1 36	8 30	1	92	
23	72	13	1 41	00	29 80	1 80	
24	85	6	1 21				
25	81	34	1 53	8	80	1 72	
26	75	29	1 54	12	85	1 73	
27	85	16	1 31				
28	25 4	38	1 34	6	76	1 70	
29	27 90	37	1 47				
30	95	6	1 11	00	37	1 37	
31	28	14	1 14				

May.

May.				June.			
<i>Da. of Mo.</i>	<i>Zurich in English Inches.</i>	<i>Upm. in English Inches.</i>	<i>Diff. in English Inches.</i>	<i>Zurich in Engl. Inches.</i>	<i>Upm. in English Inches.</i>	<i>Diff. in English Inches.</i>	
1	28 0	29 53	1 53	27 95	29 65	1 70	
2	6	69	1 63	28 6	55	1 49	
3				27 81	86	2 5	
4	8	50	1 42	83	30 7	2 24	
5	0	44	1 44	85	29 96	2 11	
6	8	41	1 33	90	69	1 79	
7	6	36	1 10	28 8	52	1 44	
8				27 90	50	1 60	
9	26	62	1 36	90	56	1 66	
10	12	63	1 51	28 0	56	1 56	
11	0	46	1 46	27 90	58	1 68	
12	27 90	66	1 76	28 6	59	1 53	
13	81	79	1 98	27 81	36	1 55	
14	75	83	2 8	85	49	1 64	
15	72	68	1 96	90	60	1 70	
16	54	66	2 12	85	47	1 62	
17				28 3	44	1 41	
18	64	44	1 80	27 81	40	1 59	
19	72	58	1 86	81	47	1 66	
20	90	74	1 84	85	73	1 88	
21	28 0	81	1 81				
22	0	59	1 59	90	70	1 80	
23	27 95	54	1 59	97	70	1 73	
24	28 8	67	1 59	85	43	1 58	
25	17	80	1 63	96	45	1 49	
26	15	86	1 71				
27	27 85	84	1 99	72	81	2 9	
28	28 8	81	1 73	73	99	2 26	
29	0	87	1 87	72	98	2 26	
30	0	84	1 84	75	80	2 5	
31	27 90	78	1 78				

July.

July.				August.			
D of M	Zunch in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	Zunch in Engl. Inches.	Upm. in Engl. Inches.	Differ. in Engl. Inches.	
1	28	29 72	1 72	27 85	30 22	17	
2	27 95	92	1 97	81	29 84	2 3	
3	97	89	1 92	85	70	1 85	
4	95	80	1 85	28 6	72	1 56	
5	28	67	1 67	10	67	1 57	
6	27 75	69	1 94	8	56	1 48	
7	81	72	1 91	0	57	1 57	
8	28	69	1 69	27 81	93	2 12	
9	8	68	1 60	85	93	2 13	
10	12	80	1 68	90	62	1 72	
11	0	84	1 84	95	66	1 71	
12	27 81	90	2 9	28 8	89	1 81	
13	93	83	1 95	0	93	1 93	
14	28 6	68	1 62	27 85	93	2 8	
15				75	84	2 9	
16				72	80	2 8	
17	27 95	63	1 63	73	55	1 82	
18	90	77	1 87	72	19	1 47	
19	28	76	1 76	90	61	1 71	
20	27 72	84	2 12	95	81	1 86	
21	28	66	1 66	72	93	2 21	
22	6	50	1 44	81	77	1 96	
23	17	56	1 39	90	93	2 3	
24	8	84	1 76	95	53	1 58	
25	6	73	1 67	28 00	51	1 51	
26				00	51	1 51	
27	27 95	82	1 87	27 95	52	1 57	
28	85	54	1 69	85	63	1 78	
29	95	66	1 71	28	51	1 51	
30	85	61	1 76	27 85	62	1 77	
31	81	95	2 15	28 6	56	1 50	

September.				October.			
D. of M.	Lat. in Eng. Inches.	Long. in Eng. Inches.	Differ. in Eng. Inches.	D. of M.	Lat. in Eng. Inches.	Long. in Eng. Inches.	Differ. in Eng. Inches.
1	28	6	29 58	1	52	27 72	29 92
2		00	54	2	54	69	93
3	17		50	3	33		
4	8		48	4	40		
5	27	72	61	5	89	72	73
6				6		85	30
7	72		45	7	73		
8	72		49	8	77	81	29
9				9			
10	81		45	10	64	72	86
11				11		64	86
12	64		67	12	3	72	30
13	46		48	13	2		6
14	72		43	14	71	90	29
15	85	28	65	15	80		41
16				16			
17	72	29	30	17	58	87	79
18	69		67	18	98	28	6
19				19		00	59
20	72		88	20	16	27	72
21	75		86	21	11	72	30
22	75		85	22	10	90	22
23	75		96	23	21	95	29
24	81	30	20	24	39	95	74
25	56		17	25	61	64	89
26	50		12	26	62	85	80
27	64		84	27	25	81	67
28	81		94	28	13	81	63
29				29		28	00
30	72		73	30	1	27	90
31				31			80

November.				December.			
Da. f Mo.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Diff. in Engl. Inches.	Zurich in Engl. Inches.	Upm. in Engl. Inches.	Diff. in Engl. Inches.	
1	28 22	30 21	1 99	28 26	29 36	1 10	
2	24	18	1 94	30	45	1 15	
3				22	50	83	
4				27 99	28 95	0 97	
5	15	6	1 91	73	92	1 19	
6	08	12	2 4	77	29 11	1 34	
7	17	29 86	1 69	85	11	1 26	
8				99	15	1 16	
9	22	30 8	1 86	28 15	24	1 9	
10	17	10	1 93	15	24	1 9	
11	22	29 78	1 56	08	28	1 20	
12				27 99	40	1 41	
13	22	30 10	1 88	90	59	1 69	
14	17	00	1 83	73	83	2 10	
15							
16	22	15	1 93				
17	26			75	74	1 99	
18				90	77	1 77	
19	22	29 88	1 66	95	52	1 57	
20				99	60	1 61	
21	22	50	1 28	28 6	61	1 55	
22				6	50	1 44	
23	27 77	27	1 50	27 99	77	1 78	
24	90	60	1 70	28 17	28	1 11	
25	28 17	84	1 67	26	36	1 10	
26				17	30 14	1 97	
27				22	28	2 6	
28							
29				17	29 83	1 66	
30	26	45	1 19	15	80	1 65	
31					49	1 32	

*A Table of the Rain at Pisa in Italy, both in Tuscan, and English Troy-Weight, which fell through a Tunnel of half a Brace Square, from May till the end of December 1767: As also the quantity of Rain at Upminster in Essex at the same time, which fell through a round Tunnel of 12 Inches Diameter, in Pounds Troy, and Centesimals of a Pound.*

D. of Mo.	May.			June.		
	Pisa Rain in Tuscan Weight.	Pisa Rain re- duced to Eng. W.	Rain at Upmin- ster.	Rain at Pisa in Tuscan Weight.	Pisa Rain re- duced to Eng. P.	Rain at Upmin- ster.
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.
1						0 17
2						2 90
3						0 05
4						
5						
6						0 55
7						
8				5 75	12	
9						
10						0 06
11						0 02
12						
13						
14						
15						0 29
16						
17						
18						
19						
20						
21						
22	0 90	69	2 70			
23			1 26			
24			0 17			0 85
25						0 42
26						
27						0 33
28						0 23
29			0 56			
30			0 56			0 81
31	Tot. w <sup>t</sup>	0 695	25		5 126	68
	Dep. in Inch.	0 12	1 05		0 88	1 34

July.			August.		
D. of Rain in Pica	Pica Rain re- duced to eight	Rain at Up-land to min- utes per liter.	Pica Rain in Pica	Pica Rain re- duced to min- utes per liter.	Rain at Up-land to min- utes per liter.
1	2	3	1	2	3
1		0			
2			1	11	01 90
3		0 92			
4		0 10			0 76
5		0 25			0 09
6	2	1 8			3 34
7					0 16
8					0 45
9					0 81
10					
11		0 60			
12		1 12			
13		0 3			0 10
14					0 07
15					
16		0 17			
17		0 16			1 66
18	0 3	0 23			
19			32	5 9 75	0 10
20			1	0 1 53	0 02
21					
22		0 94			
23		0 05			
24			1	4 1 23	
25					
26					
27					
28		0 92			
29		0 20			
30					0 5
31					0 9
T 32	2	7 5 37	0 a.	1 51	0 88
Dep. in Feb.	0 25	1 27	0 a.	5 76	2 176

September



September.				October.			
D. of M.	Rain at Pisa in Tuscan Weight.	Pisa Rain reduced to Eng. w.	Rain at Up-minster.	Rain at Pisa in Tuscan Weight.	Pisa Rain reduced to Eng. w.	Rain at Up-minster.	
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.	
1							
2						2 54	
3				4 84	28		
4							
5						0 69	
6			0 51				
7			0 02	7 76	96		
8			0 04				
9			1 40	1 91	61		
10							
11	0 50	38	0 70	2 32	06		
12							
13	0 40	31	0 51				
14	2 11	2 68	0 06				
15				3 10	3 52		
16				1 81	53		
17							
18			0 10				
19			0 8-				
20	3 83	36					
21	7 97	11	1 65			1 62	
22	10 09	18					
23	3 22	91				0 80	
24	6 106	27	2 73			0 26	
25			0 85				
26			0 46				
27			2 76				
28							
29	5 105	35	1 84			0 71	
30							
31							
Total w.	37 55	14 50		19 96	6 62		
Dep. in Inch.	6 45	2 90		3 42	1 22	4	

November.				December.			
D. of Mo.	Rain at Pisa in Tuscan Weight.	Pisa Rain reduced to Eng. W.	Rain at Upminster.	Rain at Pisa in Tuscan Weight.	Pisa Rain reduced to Eng. P.	Rain at Upminster.	
	l. oz.	l. dec.	l. dec.	l. oz.	l. dec.	l. dec.	
1							
2				2 8	2 45	0 44	
3			0 33			0 65	
4							
5							
6						0 63	
7						0 25	
8				5 4	4 89		
9	9 4	8 57				0 84	
10				2 10	2 60		
11							
12				2 8	2 45	1 67	
13							
14			0 53				
15						1 24	
16				3 10	3 52	0 96	
17			0 32				
18							
19	3 9	3 44					
20				5 6	5 05	0 82	
21			0 86			1 38	
22						0 22	
23	9 5	8 64				0 25	
24	0 6	0 46	3 08				
25	2 4	2 14				0 16	
26			0 28	3 2	2 91		
27	1 5	1 30		7 3	6 65	0 62	
28						1 93	
29				7 5	6 80		
30			0 50			0 03	
31							
Total w.	24 55	5 90			37 32	12 14	
Dep. in In. b.	4 22	1 18			6 39	2 42	8

*A Table of the Rain at Zurich in Switzerland, at Pisa, and Upminster, in the Year 1708. All reduc'd to the Depth in English Inches, and Centesimals of an Inch.*

January.					February.				
D. of M.	Rain at Zurich Inches.	Rain at Pisa l. oz.	Pisa Ra. reduc'd l. dec.	Rain at Upm. l. dec.	Rain at Zurich Inches.	Rain at Pisa l. oz.	Pisa Ra. reduc'd l. dec.	Rain at Upm. l. dec.	
1		5 8	5 20						
2	I				2	$\frac{1}{2}$ 3	3 2 98		
3									
4		7 26	58	0 97	I	$\frac{3}{4}$			
5	I			0 29		$\frac{3}{4}$ 0	10 0 76		
6				0 7	2			0 2	
7									
8					2				
9		6 35	74	0 53		2 42	14		
10				2 48		I 81	53		
11				I 26					
12					2	$\frac{1}{2}$ 0	9 0 69		
13				I 91					
14		3 43	61	88					
15	4			0 4		$\frac{1}{2}$		0 18	
16				0 92					
17		5 65	5		I	$\frac{3}{4}$			
18		2 92	52	I 26					
19					4	$\frac{1}{2}$			
20	I $\frac{1}{2}$					$\frac{1}{6}$ 2	I I 90	0 54	
21	I							0 51	
22	4			0 91					
23	2					7 26	58	0 64	
24	2	3 63	21						
25	I $\frac{1}{2}$			I 7				0 19	
26				0 80					
27		4 13	75						
28						2 92	52		
29	$\frac{1}{2}$					$\frac{1}{2}$		0 22	
30									
31		2 52	22						
Tot.	18 $\frac{1}{2}$		37 33	14 39	18 $\frac{2}{3}$		19 102	30	
Dep	I 64		6 41	2 878	I 65		3 280	46	

March.					April.				
Da. of Mo.	Rain at Zurich. inches.	Rain at Pisa. l. oz.	Pisa Rai. reduced. l. dec.	Rain at Upm. l. dec.	Rain at Zurich. Lines.	Rain at Pisa. l. oz.	Pisa Rai. reduced. l. dec.	Rain at Upm. l. dec.	
1	2	$\frac{1}{4}$			9	$\frac{3}{4}$		I 16	
2						2	101	680 16	
3					7	$\frac{3}{4}$	2	42 14	
4						0	90	69	
5								I 54	
6				I 27					
7					I				
8					3				
9								0 16	
10				0 38	I	$\frac{1}{4}$		0 24	
11				0 37		$\frac{3}{4}$			
12	3	$\frac{1}{2}$						0 85	
13		8	17	40					
14				0 37		$\frac{1}{3}$			
15									
16					4	$\frac{3}{4}$			
17					5	$\frac{1}{2}$	0 100	76	
18		6	35	74	3	$\frac{1}{2}$			
19	2	$\frac{3}{4}$		0 25		2	21	99	
20				0 8	5				
21				0 20					
22				I 37					
23	2	$\frac{1}{2}$		I 06	6				
24		$\frac{1}{6}$		I 37		$\frac{1}{2}$			
25				I 43	3	$\frac{1}{4}$			
26		$\frac{1}{4}$				$\frac{1}{3}$			
27				I 29					
28				0 15					
29				0 54				0 65	
30	I	$\frac{1}{2}$						0 01	
31	3	$\frac{1}{2}$	2	62 29					
Tot.	17	$\frac{1}{8}$		15 43	10 13	52	$\frac{3}{4}$	7 264 77	
Dep	I	51		2 65	2 31	4 69		I 250 96	

IV. *An Account of an Experiment touching the Propagation of Sound through Water.* By Mr. Fr. Hauksbee, F. R. S.

**A**N Experiment that I made some time since, shewing that actual Sound could not be transmitted through a Vacuum, gave me an Inclination to try what would be the effect, to surround the Receiver that contain'd the sounding Body, with so dense a Medium as Water. Accordingly, as in the former Experiment, the Receiver which contain'd the Bell was screw'd down to a Brass-plate, with a Leather between; This Receiver with its Bell, was suspended in a large Glass-Vessel, by Four Twine-threads to the top, and as many to the bottom: whereby it remain'd in the middle between both. Concluding likewise, that these Threads would so absorbe the Water when it should come to be put in, that there could be no Apprehension, that any Sound shou'd be convey'd by them from the sounding Body, any more than if they were intirely Water. Thus provided, the Clapper was made to strike the Bell, whose Sound was something less by the Interposition of the Glass, than it would be, had it been made in the open Air; however it was very audible, and might be heard at a considerable distance: It appear'd to the Ear to be very harsh, in respect to the Tone it afforded us. But now, when the Water came to be pour'd in, and the inward Receiver surrounded by it, at least an Inch and an half from the nearest part of the outward Glass, the Clapper again was made to give the Sound; which it did, seemingly, very little less,

in

July.				August.				September.			
Da. of Mo.	Rain at Zurich.	Rain at Upm.	Rain at Upm.	Rain at Zurich.	Rain at Upm.	Rain at Zurich.	Rain at Upm.				
	Lins.	l. dec.						Lins.	l. dec.	Lins.	l. dec.
1	1	0 06									
2											
3	2						0 74				
4		0 03					0 06				
5											
6	25	$\frac{1}{2}$					0 64				
7			3 38			2					
8		0 93				7 $\frac{3}{4}$	0 40				
9		0 49				4 $\frac{1}{4}$					
10		0 59					0 05				
11		0 47		0 07			0 01				
12		0 01					1 41				
13		0 11									
14						5 $\frac{3}{4}$	1 24				
15		1 00				2 $\frac{1}{4}$	1 10				
16		0 16									
17				1 05							
18			3 $\frac{3}{4}$	0 56		7 $\frac{3}{4}$	0 29				
19											
20	2	$\frac{2}{3}$									
21		0 01									
22											
23			27 $\frac{3}{4}$				0 27				
24		0 01		0 15							
25		0 41	1 $\frac{1}{4}$	0 76							
26											
27				0 31		3 $\frac{3}{4}$					
28		1 20									
29			2 $\frac{1}{2}$	1 32			0 99				
30		0 04		$\frac{1}{4}$			0 08				
31	3			7 10							
Tot.	39 $\frac{1}{3}$	5 52	35 $\frac{1}{2}$	14 70		34	7 28				
Dep.	3 50	1 11	3 15	2 94		3 02	1 46				

October.

October.			Novemb.			December.		
D. of Mo.	Rain at Zurich.	Rain at Upm.	Rain at Zurich.	Rain at Upm.	Rain at Zurich.	Rain at Upm.	Lines.	l. dec.
	Lines.	l. dec.	Lines.	l. dec.	Lines.	l. dec.		
1							0	10
2		0 03					0	61
3							0	08
4				0 92			0	27
5		0 08			17	$\frac{1}{2}$	0	
6								
7								
8							0	30
9							0	66
10								
11	4	$\frac{1}{2}$		2 22				
12		0 06	$\frac{3}{4}$	0 26				
13		0 37			8			
14		0 16						
15								
16								
17							0	54
18		0 31					1	84
19								
20								
21	13	$\frac{1}{2}$					1	22
22								
23		0 02	6	$\frac{3}{4}$			4	00
24							0	22
25								
26	6	$\frac{3}{4}$						
27								
28		0 06						
29								
30				0 90		$\frac{1}{2}$		
31	2	$\frac{3}{4}$			3	$\frac{1}{2}$		
T <sub>o</sub>	27	$\frac{1}{2}$	2	14	7	$\frac{1}{2}$	9	84
D.	2	44	0	62	0	62	1	97

*A Prospect of all the Rain in the foregoing Tables, in every Month, Half Year, and the whole Year, from June 1. N. S. or May 21. O. S. 1707. to the end of the Year 1708.*

	Depth of the Pisa Rain.	Depth of the Upm. Rain.	Depth of the Zurich Rain.
	Englisch Inches.	Englisch Inches.	Englisch Inches.
May.	0	12	05
June.	0	88	1 34
July.	0	36	1 27
August.	5	76	2 18
September.	6	45	2 90
October.	3	43	1 33
November.	4	22	1 18
<i>The Half Year's Rain.</i>	21	22	11 25
December.	6	39	2 43
Anno 1708.			
January.	6	41	2 88
February.	3	28	0 46
March.	2	65	2 03
April.	1	25	0 96
May.	3	33	2 02
<i>The Half Year's Rain.</i>	23	31	10 78
<i>Depth of the whole Year's Rain.</i>	44	53	22 03
June.	4	90	2 32
<i>The Half Year's Rain.</i>		10	67
July.		1	11
August.	2	27	2 94
September.	7	21	1 46
October.	5	33	0 23
November.	0	13	0 86
December.		1	97
<i>The Half Year's Rain.</i>	19	84	8 57
<i>The whole Year's Rain.</i>		19	24



*A Table of the Rain at Pisa in some of the latter Six Months of the Year 1708. in Tuscan Pounds and Ounces; and the same reduced to English Pounds Troy-weight, and Centesimal Parts. Observed by Dr. Michael Angelo Tilli*

June.				July.		August.			
Tuscan Weight		English Weight.				Tuscan Weight.		English Weight.	
l.	oz.	l.	dec.			l.	oz.	l.	oz.
1									
2	4	1	3 75						
3	2	2	1 99						
4									
5	3	4	3 06						
6	2	8	2 45						
7									
8	3	3	2 98						
9									
10	0	9	0 69						
11									
12									
13									
14	2	1	2 68			10	19	25	
15	0	10	0 76			1	8	1 53	
16									
17						2	8	2 45	
18	11	1	10 17						
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
Total W.		28	53					13	23
Depth.		4	90					2	27

September.				October.				November.					
D. of M.	Tuscan Weight.		English Weight.		Tuscan Weight.		English Weight.		Tuscan Weight.		English Weight.		
	l.	oz.	l.	dec.	l.	oz.	l.	dec.	l.	oz.	l.	dec.	
1	1	2	1	07	5	14	67		3	32	98		
2													
3	10	09	9	18									
4													
5													
6													
7	12	2	11	17									
8													
9					4	43	98		2	01	84		
10													
11					14	5	13-13						
12									3	63	21		
13													
14													
15	2	8	2	45	2	32	06						
16													
17													
18					2	62	29						
19					1	91	61						
20													
21	10	49	48										
22													
23													
24	9	48	57										
25													
26					3	73	29						
27													
28													
29													
30													
31													
Total W.				41 92					31 03	8 03			
Depth.				7 21					5 33	0 13			